

A1.1.1.1.1

Compare and/or order any real numbers.

Note: Rational and irrational may be mixed.

1. Which of the following inequalities is true for **all** real values of x ?

A. $x^3 \geq x^2$ C. $(2x)^2 \geq 2x^2$
 B. $3x^2 \geq 2x^3$ D. $3(x-2)^2 \geq 3x^2 - 2$

2. Which of the following represents the greatest value?

A. 6^3 C. $(6^3)^2$
 B. 3^6 D. $\frac{6^6}{6^3}$

3. If you were to order the real numbers below from the largest to the smallest, which real number would be the third in your list?

$-5, -\sqrt{24}, -\frac{26}{5}, -5.5, -2\pi, -4\frac{3}{4}$

A. -5 B. -5.5 C. -2π D. $-\sqrt{24}$

4. Compare the two absolute value expressions and choose the statement below that is true.

Expression 1: $|-33| - |0|$

Expression 2: $|0| - |-33|$

- a. Expression 1 is greater than Expression 2.
 b. Expression 2 is greater than Expression 1.
 c. The expressions are equal.
 d. There is not enough information for a comparison.

5. Four numbers are shown.

$\frac{31}{4}$ $7\frac{5}{8}$ $\sqrt{50}$ 7.82

Which shows these numbers ordered from least to greatest?

A. $7\frac{5}{8}, \frac{31}{4}, 7.82, \sqrt{50}$ C. $\sqrt{50}, 7\frac{5}{8}, \frac{31}{4}, 7.82$
 B. $\sqrt{50}, 7.82, \frac{31}{4}, 7\frac{5}{8}$ D. $\frac{31}{4}, \sqrt{50}, 7\frac{5}{8}, 7.82$

6. When $x > 1$, which expression has a value less than x ?

A. $2.5x^2$ B. $x^3 + 4$ C. $\sqrt{x} - 2$ D. $\sqrt{x} + x$

7. Which sequence of numerals is equivalent to:

$\frac{2}{3}$ 10% 0.8 6

A. $\frac{4}{6}, \frac{1}{10}, \frac{8}{100}, 0.06$ C. $66\frac{2}{3}\%, \frac{2}{20}, \frac{4}{5}, 6.0$
 B. 0.67, 1.0, 8%, 6.00 D. $\frac{2}{3}, 0.01, 80\%, 6\%$

A1.1.1.1.2

Simplify square roots

8. An expression is shown below.

$2\sqrt{51x}$

Which value of x makes the expression equivalent to $10\sqrt{51}$?

A. 5 B. 25 C. 50 D. 100

9. An expression is shown below.

$\sqrt{87x}$

For which value of x should the expression be further simplified?

A. $x = 10$ B. $x = 13$ C. $x = 21$ D. $x = 38$

10. Which expression is equivalent to $(\sqrt{2x^2})^4$?

A. $2x^4$ B. $4x^4$ C. $4x^8$ D. $8x^8$

11. Which number equals $3\sqrt{56}$?

A. $6\sqrt{14}$ B. $12\sqrt{7}$ C. $15\sqrt{6}$ D. $8\sqrt{28}$

12. On the number line, point R represents the square root of a number.



Which value could be the square root of the number represented by R?

A. 137 B. 149 C. 165 D. 173

A1.1.1.2.1

Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.

13. Two monomials are shown below.

$$450x^2y^5 \quad 3,000x^4y^3$$

What is the least common multiple (LCM) of these monomials?

- A. $2xy$ C. $150x^2y^3$
 B. $30xy$ D. $9,000x^4y^5$
14. Which expression is the greatest common factor of

$$125t^3m^5 + 60t^4m^4 + 85t^5m^2?$$

- A. $5t^3m^2$ B. $5t^4m^2$ C. $5t^4m^4$ D. $5t^5m^5$
15. Which of the following is equivalent to

$$ns^3 + n^2s?$$

- A. $ns(s^2 + 1)$ C. $ns(s^2 + s)$
 B. $ns(s^2 + n)$ D. $ns^2(s + n)$

A1.1.1.3.1

Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems.

Note: Exponents should be integers from -10 to 10.

16. Simplify $2(2\sqrt{4})^{-2}$

- A. $\frac{1}{8}$ B. $\frac{1}{4}$ C. 16 D. 32

17. Which expression is the same as $(a^2b^{-3})^{-4}$?

- A. a^2b^7 B. $\frac{1}{a^2b^7}$ C. $\frac{b^{12}}{a^8}$ D. $\frac{a^8}{b^{12}}$

18. Which expression is the correct simplification of $(x^2)^{-\frac{1}{2}}$?

- A. 0 B. x^2 C. 1 D. x

A1.1.1.4.1

Use estimation to solve problems.

19. A theme park charges \$52 for a day pass and \$110 for a week pass. Last month, 4,432 day passes were sold and 979 week passes were sold. Which is the **closest estimate** of the total amount of money paid for the day and week passes for last month?

- A. \$300,000 C. \$500,000
 B. \$400,000 D. \$600,000

20. Joel has a 50-meter roll of copper wire that weighs 7.5 kilograms. Approximately how many meters of wire will be in a new shipment that weighs 502.5 kilograms?

- A. 75 m C. 3,350 m
 B. 610 m D. 3,770 m

A1.1.1.5.1

Add, subtract, and/or multiply polynomial expressions (express answers in simplest form).

Note: Nothing larger than a binomial multiplied by a trinomial.

21. A polynomial expression is shown below.

$$(mx^3 + 3)(2x^2 + 5x + 2) - (8x^5 + 20x^4)$$

The expression is simplified to

$$8x^3 + 6x^2 + 15x + 6.$$

What is the value of m ?

- A. -8 B. -4 C. 4 D. 8

22. Simplify $(a^3 - 5a + b - 2) - (3a^3 + 5a - b + 2)$

- A. $-2a^3$ C. $-2a^3 - 10a + 2b$
 B. $-2a^3 + 2b$ D. $-2a^3 - 10a + 2b - 4$

23. What polynomial equals $(x + 6)(2x - 3)$?

- A. $2x^2 + 9x - 18$ C. $x^2 + 8x - 9$
 B. $2x^2 + 12x + 3$ D. $x^2 - 11x + 6$

24. The sum of $4x^3 + 6x^2 + 2x - 3$ and $3x^3 + 3x^2 - 5x - 5$ is

- A. $7x^3 + 3x^2 - 3x - 8$
- B. $7x^3 + 3x^2 + 7x + 2$
- C. $7x^3 + 9x^2 - 3x - 8$
- D. $7x^6 + 9x^4 - 3x^2 - 8$

A1.1.1.5.2

Factor algebraic expressions, including difference of squares and trinomials.

Note: Trinomials are limited to the form ax^2+bx+c where a is equal to 1 after factoring out all monomial factors.

25. When the expression $x^2 - 3x - 18$ is factored completely, which is one of its factors?

- A. $(x - 2)$ B. $(x - 3)$ C. $(x - 6)$ D. $(x - 9)$

26. Which expression is a factor of $4x^2 + 10x + 6$?

- A. $2(x+3)$ C. $4(x+3)$
- B. $2x+3$ D. $4x+3$

27. Which expression represents $y^4 - 36$ in simplest factored form?

- A. $(y^2 + 4)(y^2 - 9)$
- B. $(y + 4)(y + 3)(y - 3)$
- C. $(y^2 + 6)(y^2 - 6)$
- D. $(y^4 - 36)(y + 1)$

28. Which of the following is a factor of

$$6x^2 - 13x + 5$$

- A. $x + 1$ B. $2x - 1$ C. $3x + 1$ D. $6x - 1$

A1.1.1.5.3

Simplify/reduce a rational algebraic expression.

29. Simplify $\frac{-3x^3+9x^2+30x}{-3x^3-18x^2-24x}$; $x \neq -4, -2, 0$

- A. $-\frac{1}{2}x^2 - \frac{5}{4}x$ C. $\frac{x+5}{x-4}$
- B. $x^3 - \frac{1}{2}x^2 - \frac{5}{4}x$ D. $\frac{x-5}{x+4}$

30. What is the sum of $\frac{-x+7}{2x+4}$ and $\frac{2x+5}{2x+4}$?

- A. $\frac{x+12}{2x+4}$ C. $\frac{x+12}{4x+8}$
- B. $\frac{3x+12}{2x+4}$ D. $\frac{3x+12}{4x+8}$

31. When the following expression is simplified, what is the numerator?

$$\frac{6x^2 + 21x + 9}{4x^2 - 1}$$

- A. $3(x+1)$ C. $3(2x + 3)$
- B. $3(x + 3)$ D. $3(x + 3)$

A1.1.2.1.1

Write, solve, and/or apply a linear equation (including problem situations).

32. Mr. and Mrs. Rodriguez are taking their children to Colonial Williamsburg. A 1-day admission pass is \$33 for an adult and \$16.50 for a child. If they pay a total of \$115.50 admission for themselves and their children, how many children do they have?

- A. 2 B. 3 C. 4 D. 5

33. Luigi earns \$8 per hour baby-sitting and \$10 per hour working at a movie theater. If he baby-sits 50 hours in a year, how many hours would he need to work at the theater in order to earn \$3,000 for a computer? Which equation represents this situation where x is the number of hours he would need to work at the theater?

- A. $400 + 10x = 3,000$ C. $8x + 10x = 3,000$
- B. $500 + 8x = 3,000$ D. $10x = 3,400$

34. A taxi ride cost \$29.40. The driver charged \$3 plus \$0.40 per 0.2 mile traveled. How far did the taxi travel on this trip?

- A. 9.8 mi B. 13.2 mi C. 66 mi D. 73.5 mi

35. Which of the following equations has an infinite number of solutions?

- A. $x = \frac{1}{2}$ C. $3x + 5 = 2x - 1 + x$
- B. $2x - 1 = x + 3$ D. $-x - 1 = -1 - x$

36. Michael paid \$6.00 for a ticket to a football game. Soft drinks at the game cost \$0.75. Michael bought x drinks at the game. Which equation represents the total amount(y) he spent?

A. $y = (6 + 0.75)x$ C. $y = 6 - 0.75x$
 B. $y = 6x + 0.75$ D. $y = 6 + 0.75x$

A1.1.2.1.2

Use and/or identify an algebraic property to justify any step in an equation-solving process.

Note: Linear equations only.

37. Stan's solution to an equation is shown below.

Given: $n+8(n+20)=110$
 Step 1: $n+8n+20=110$
 Step 2: $9n+20=110$
 Step 3: $9n=110-20$
 Step 4: $9n=90$
 Step 5: $\frac{9n}{9}=\frac{90}{9}$
 Step 6: $n=10$

Which statement about Stan's solution is true?

- A. Stan's solution is correct
 B. Stan made a mistake in step 1
 C. Stan made a mistake in step 3
 D. Stan made a mistake in step 5

38. One of the steps Jamie used to solve an equation is shown below.

$$\begin{aligned} -5(3x + 7) &= 10 \\ -15x + -35 &= 10 \end{aligned}$$

Which statements describe the procedure Jamie used in this step and identify the property that justifies the procedure?

- A. Jamie added -5 and $3x$ to eliminate the parentheses. This procedure is justified by the associative property.
 B. Jamie added -5 and $3x$ to eliminate the parentheses. This procedure is justified by the distributive property.
 C. Jamie multiplied $3x$ and 7 by -5 to eliminate the parentheses. This procedure is justified by the associative property.
 D. Jamie multiplied $3x$ and 7 by -5 to eliminate the parentheses. This procedure is justified by the distributive property.

39. Solve $3(x+5) = 2x + 35$

Step 1: $3x + 15 = 2x + 35$
 Step 2: $5x + 15 = 35$
 Step 3: $5x = 20$
 Step 4: $x = 4$

Which is the first incorrect step in the solution shown above?

- A. Step 1 B. Step 2 C. Step 3 D. Step 4

A1.1.2.1.3

Interpret solutions to problems in the context of the problem situation.

Note: Linear equations only.

40. Francisco purchased x hot dogs and y hamburgers at a baseball game. He spent a total of \$10. The equation below describes the relationship between the number of hot dogs and the number of hamburgers purchased.

$$3x + 4y = 10$$

The ordered pair $(2, 1)$ is a solution of the equation. What does the solution $(2, 1)$ represent?

- A. Hamburgers cost 2 times as much as hot dogs.
 B. Francisco purchased 2 hot dogs & 1 hamburger.
 C. Hot dogs cost \$2 each & hamburgers cost \$1 each.
 D. Francisco spent \$2 on hot dogs & \$1 on hamburgers.

41. The data in the table show the cost of renting a bicycle by the hour, including a deposit.

Hours (h)	Cost in Dollars (c)
2	15
5	30
8	45

The equation of the line that fits the data is $c = 5h + 5$. An ordered pair that is a solution to the equation is $(3, 20)$. What does that solution represent?

- A. The deposit for renting the bicycle for 3 hours is \$20.
 B. The cost is \$20 to rent a bicycle for 3 hours.
 C. The deposit is \$3 when the total cost is \$20
 D. The cost is \$3 for renting a bicycle for 20 hours